

# A LATE TRIASSIC CYNODONT FROM THE AMERICAN SOUTH-WEST

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**ABSTRACT.** A right dentary fragment and two postcanine teeth from the upper shale member of the Chinle Formation (Late Triassic: Norian) at Bull Canyon, Guadalupe County, New Mexico represent a new species of cynodont, *Pseudotriciconodon chatterjeei*. *P. chatterjeei* differs from *P. wildi* from the Norian of Luxembourg, type and only other known species of *Pseudotriciconodon*, by its smaller size and striated enamel. The term Dromatheriidae has been used to embrace small cynodonts with multicusps, laterally compressed postcanine teeth, but too little is known of the dromatheriids to confirm the unity of the family or assess unambiguously their phylogenetic relationships to other cynodonts.

ALTHOUGH Late Triassic vertebrates have been known from the American South-west for more than a century, and recent collecting has increased their diversity substantially, quarrying and screenwashing have revealed hitherto unknown taxa, particularly of smaller vertebrates. New finds include dinosaurs, ictiosaurs, pterosaurs, and sphenodontids (e.g. Murry 1982; Chatterjee 1983, 1984; Lucas *et al.* 1985*b*; Murry 1986). These new discoveries have enhanced our knowledge of vertebrate faunal composition near the end of the Triassic and, among other things, provide important data for the more precise correlation of the Upper Triassic strata of the South-west with those of eastern North America and western Europe.

Our efforts to collect Late Triassic microvertebrates have focused on the upper shale member of the Chinle Formation at Bull Canyon, east-central New Mexico. This stratigraphic unit has produced fossil vertebrates for nearly a century as well as megafossil plants and nonmarine invertebrates (Ash 1972; Kues 1985; Lucas *et al.* 1985*a*). The vertebrate fauna indicates a Late Triassic (Norian) age and is dominated by fossils of parasuchian reptiles (*Rutiodon* spp. and *Nicosaurus gregorii*) and metoposaurid labyrinthodonts. Among the many fish scales and reptile teeth recovered from our screenwashing operation are a miniscule jaw fragment and teeth of a cynodont. These fossils appear to represent a new species of the family Dromatheriidae, a poorly known group of Triassic cynodonts not previously reported from the American South-west.

## SYSTEMATIC PALAEOONTOLOGY

Order THERAPSIDA Broom, 1905

Infraorder CYNODONTIA Owen, 1861

Family 'DROMATHERIIDAE' Gill, 1872

Genus PSEUDOTRICONODON Hahn, Lepage and Wouters, 1984

*Pseudotriciconodon chatterjeei* sp. nov.

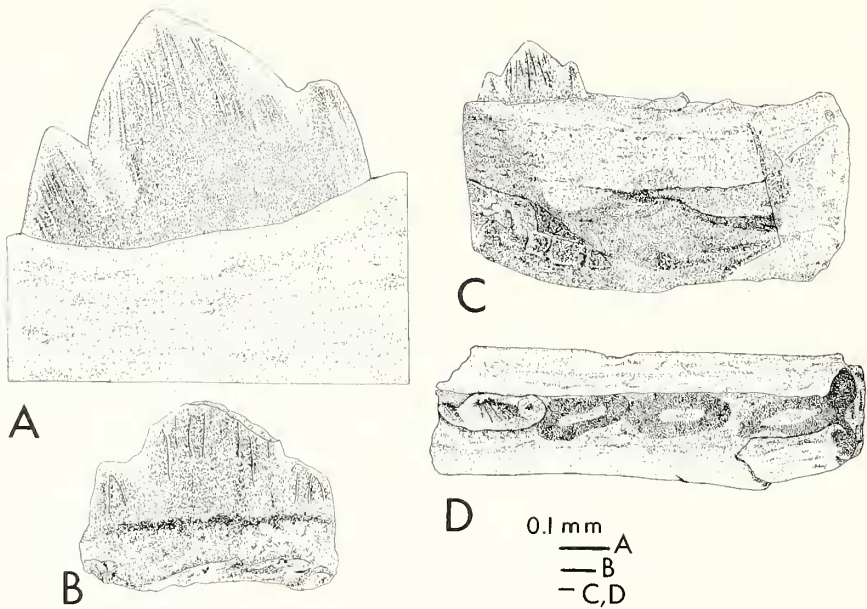
Text-fig. 1A-D

1985 Cynodontia: Lucas, Oakes and Frochlich, p. 205, fig. 6.

1986 Dromatheriidae: Oakes and Lucas, p. 22.

*Etymology.* The specific name is for Dr Sankar Chatterjee of Texas Tech. University in recognition of his many contributions to the vertebrate palaeontology of the Triassic.

*Holotype.* UNM MV-518, a right dentary fragment and two teeth (text-fig. 1) in the collection of the University of New Mexico, Albuquerque.



TEXT-FIG. 1. UNM MV-518, holotype of *Pseudotricodon chatterjeei* sp. nov. A, right lateral view of postcanine tooth in dentary. B, right lateral view of isolated postcanine tooth. C, D, right lateral (C) and occlusal (D) views of right dentary fragment.

*Horizon and locality.* Upper shale member of the Chinle Formation, SW1/4 SW1/4 SW1/4 section 28, T9N, R26E, Bull Canyon, Guadalupe County, New Mexico, USA. See Lucas *et al.* (1985b) for more detailed stratigraphic information.

*Holotype dimensions.* Postcanine tooth in dentary: length 0.71 mm, width 0.25 mm, height of main cuspid 0.41 mm, height of anterior cuspid 0.23 mm, height of posterior cuspid 0.21 mm; depth of dentary below postcanine tooth 1.15 mm; length of isolated postcanine tooth 0.63 mm.

*Diagnosis.* Postcanine teeth about 30–40% smaller than those of *Pseudotricodon wildi*; also differs from *P. wildi* in having many distinct striations on the labial and lingual aspects of the postcanine teeth that extend towards, but do not reach, the base of the crown.

*Description.* UNM MV-518 is a right dentary fragment bearing three root-filled alveoli followed by a postcanine tooth (text-fig. 1C, D), and an isolated postcanine tooth (text-fig. 1B). Because of the close association of the dentary fragment and the isolated tooth, we believe the isolated tooth is from the dentary fragment, although its eroded base cannot be attached to the dentary fragment. In the event that the isolated tooth is later shown not to be from the dentary fragment, the holotype of *P. chatterjeei* should be restricted to the dentary fragment.

The postcanine teeth are tricuspid, with two cusps arranged symmetrically on the anterior and posterior edges of the main (central) cuspid. The main cuspid is about twice as tall as the other two cusps, which are of subequal size and, in lateral view, the main cuspid is a low broad triangle. Striations on the labial and lingual aspects of the tooth run dorsoventrally but do not reach the base of the crown. The wear on the cusps is apical.

Tooth cross-section is semi-oval so there is essentially no mediolateral expansion of the crown in occlusal view. The crown has no basal cingulids, and no basal groove separates the crown from the root. A single large root supports the crown and what is visible of this root, and its base within the dentary, show no evidence of bifurcation. The single, large bone (dentary) which supports the three alveoli and the postcanine tooth is slightly concave lingually and convex labially.

*Discussion.* The postcanine teeth of *P. chatterjeei* superficially resemble those of the Triassic pterosaur *Eudimorphodon* and the prolacertiform *Tanytrophens* in being tricuspid. However, the central cusps of the teeth of *Eudimorphodon* are much taller relative to the other two cusps than is the case in *P. chatterjeei* (Wild 1978, fig. 8), the cross-section of the teeth of *Eudimorphodon* is rectangular at the base of the crown and widely and irregularly biconvex in a plane through the apices of the anterior and posterior cusps (R. Wild, pers. comm. 1985), whereas the cross-section of the teeth of *P. chatterjeei* is narrowly and regularly biconvex, and the juvenile teeth of *Eudimorphodon*, although more similar to *P. chatterjeei* in cross-section and cusp proportions than the adult teeth, have smooth enamel (lack striations) (R. Wild, pers. comm. 1985). Similar differences in cusp proportions, crown cross-section, and enamel texture distinguish the teeth of *P. chatterjeei* from those of *Tanytrophens* (e.g. Wild 1980, fig. 4) and other prolacertiforms with tricuspid teeth. The teeth of prosauropod dinosaurs are multicuspate, but bear many cusps along their occlusal edges (Galton 1985) and do not closely resemble those of *P. chatterjeei*. Similarly, the postcanine teeth of triconodont mammals, with their basal cingula, smooth enamel, complex wear patterns, and bifurcated roots, do not closely resemble those of *P. chatterjeei*.

Indeed, the closest similarity of the teeth of *P. chatterjeei* is with small, multicuspate teeth from North Carolina (e.g. Simpson, 1926*b*), Luxembourg (Hahn *et al.* 1984), and Switzerland (Peyer 1956; Clemens 1980) that have been assigned to the Cynodontia. Among these cynodonts, cusp proportions, root shape, and size of the postcanine teeth of *P. chatterjeei* are closest to the 'group I' type of tooth of *P. wildi*, a taxon known only from isolated teeth from the Norian of Medernach, Luxembourg (Hary and Muller 1967; Hahn *et al.* 1984). Particularly striking is the similarity of the postcanine teeth of *P. chatterjeei* to a tooth of *P. wildi* illustrated by Hahn *et al.* (1984, pl. 1, fig. 1). Smaller postcanine tooth size and the numerous striations on the tooth crown, however, distinguish *P. chatterjeei* from *P. wildi*. Of course, it is possible that *P. chatterjeei* belongs to a genus distinct from *P. wildi*, but there is no morphological evidence now available to support such a conclusion. Moreover, there are no replacement teeth in the dentary of the holotype of *P. chatterjeei*, indicating that it is not the juvenile morphology of *P. wildi* or another cynodont. The morphological evidence thus best supports assignment of UNM MV-518 to the cynodont genus *Pseudotriciconodon* and its recognition as a species distinct from *P. wildi*, the type and only known species of that genus.

#### THE DROMATHERIIDAE

Gill (1872) coined the term Dromatheriidae (considered by him to be Marsupialia *incertae sedis*) for Emmons' (1857) *Dromatherium*, based on a lower jaw fragment from the Upper Triassic (Carnian: Olsen *et al.* 1982) Cumnock Formation of the Sanford Basin, North Carolina. Osborn (1886) subsequently named *Microconodon* for a second lower jaw fragment from the same locality. Early debate as to the mammalian affinities of these two genera was extensive (see Simpson 1926*b*, pp. 88–91 for a review). However, Simpson (1926*b*) argued convincingly that these genera are not mammals, but instead belong to the Cynodontia *incertae sedis*. However, Simpson (1926*a*, p. 549) also stated that *Dromatherium*, as well as *Microconodon*, 'must probably be considered the type of a distinct family in view of the great differences between them in tooth pattern and jaw form'.

Parrington (1947, p. 726) later characterized *Dromatherium* and *Microconodon*, together with the South African taxa *Lycorhinus* and, perhaps, *Pachygenelus* as 'unspecialized survivors of the Cynognathidae'. This may have been the impetus for Houghton and Brink's (1954) inclusion of *Pachygenelus*, *Lycorhinus*, and *Karroomys* in the Dromatheriidae.

Hahn *et al.* (1984) recently redefined the Dromatheriidae to include *Dromatherium*, *Microconodon*, European *Pseudotriciconodon*, and South American *Therioherpeton*. The incomplete skull of *Therioherpeton* is known (Bonaparte and Barberena 1975) and justifies its inclusion in the Cynodontia. Indeed, the skull of *Therioherpeton* is rather similar to that of the trithelodontid *Diarthrognathus* in lacking prefrontals and a postorbital bar and having slender zygomatic arches and a broad brain case, among other features (Bonaparte and Barberena 1975; Kemp 1982). On



the basis of these similarities, Kemp (1982) placed *Therioherpeton* in the Trithelodontidae, although, as stressed by Bonaparte and Barberena (1975), the postcanine teeth of *Therioherpeton* differ significantly from those of trithelodontids (see Gow 1980 for the teeth of trithelodontids). Indeed, the postcanine teeth of *Therioherpeton* are multicuspate, lack any mediolateral expansion of the crowns, and show an incipient stage of root bifurcation. They share these features with the postcanine teeth of *Dromatherium*, *Microconodon*, and (with the exception of root bifurcation) *Pseudotriconodon*. If the dental resemblances between *Dromatherium*, *Microconodon*, *Pseudotriconodon*, and *Therioherpeton* are indicative of close relationship, then the affinities of the Dromatheriidae arguably lie with the Trithelodontidae. The problems with strongly supporting this conclusion are largely the same now as they were 60 years ago when Simpson studied the dromatheriids: the crania of *Dromatherium* and *Microconodon* are still unknown, and the two genera are, except for some similarities in their postcanine dentition, very different. The same problems attend definite assessment of the relationships of *Pseudotriconodon*. Convergence on a multicuspate, laterally compressed postcanine tooth by Hahn *et al.*'s (1984) four dromatheriid genera also must be considered seriously.

We believe that current knowledge of the Dromatheriidae is an inadequate basis with which to determine unambiguously their phylogenetic relationships. The similarity of *P. chatterjeei* to *P. wildi* from the Norian of Europe lends some support to recent assignment of a Norian age by Lucas *et al.* (1985a), Chatterjee (1986), and Murry (1986) to the uppermost Dockum Group of western Texas and its equivalent in east-central New Mexico (upper shale member of Chinle Formation). The discovery of *Pseudotriconodon* in New Mexico broadly extends the geographic distribution of small cynodonts with multicuspid, laterally compressed postcanine teeth. The New Mexican dromatheriid thus increases the faunal similarity of the Upper Triassic Chinle-Dockum strata of the American South-west and age-equivalent strata in eastern North America and western Europe.

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